

WHAT IS CLAIMED IS:

- 1           1.       A catheter system, comprising:  
2               a catheter comprising a catheter body having a distal end, a proximal end,  
3       a main vessel guidewire lumen that is adapted to receive a main vessel guidewire and a  
4       balloon disposed near the distal end of the catheter body, the catheter further comprising a  
5       side member disposed adjacent the catheter body, the side member having a distal end, a  
6       proximal end, and a branch vessel guidewire lumen that is adapted to receive a branch  
7       vessel guidewire;  
8               a stent having a side hole through a wall thereof, the stent being disposed  
9       over the balloon;  
10              wherein a distal portion of the side member is disposed beneath at least a  
11      portion of the stent while being adjacent to and moveable with respect to the balloon.
- 1           2.       The catheter system of claim 1, further comprising:  
2               at least one radiopaque marker positioned on the catheter body; and  
3               at least one radiopaque marker positioned on the side member.
- 1           3.       The catheter system of claim 2, wherein at least one radiopaque  
2       marker on the catheter body is adjacent at least one radiopaque marker on the side  
3       member.
- 1           4.       The catheter system of claim 2, wherein the radiopaque marker on  
2       the catheter body and on the side member are positioned adjacent the side hole in the  
3       stent.
- 1           5.       The catheter system of claim 2, wherein the at least one radiopaque  
2       marker on the catheter body comprises radiopaque markers positioned at a proximal end  
3       and a distal end of the stent.
- 1           6.       The catheter system of claim 2, wherein the at least one marker on  
2       the side member is positioned at the distal end of the side member.
- 1           7.       The catheter system of claim 1, wherein the side member  
2       comprises a flexible side sheath.

8. The catheter system of claim 1, further comprising a branch stent deployment device having a balloon, a guidewire lumen, an inflation lumen that is adapted to supply a fluid to inflate the balloon, and a branch vessel stent disposed over the balloon, wherein the branch stent deployment device is adapted to be advanced over the branch stent guidewire lumen after removal of the side member.

9. The catheter system of claim 1, further comprising a connector coupled to the catheter body, wherein the side member extends through the connector so as to be slidably positionable with respect to the catheter body.

10. The catheter system of claim 1, wherein the side member is fixedly attached to at least a portion of the catheter body, and wherein the distal end of the side member extends out of the side hole of the stent.

11. The catheter system of claim 1, further comprising a balloon disposed at the distal end of the side member.

12. The catheter system of claim 1, wherein the distal end of the side member is tapered.

13. The catheter system of claim 1, wherein the distal end of the side member is fabricated from a fluoroscopically visible material.

14. The catheter system of claim 1, wherein the catheter body and the side member are fabricated from pebax and graphite.

15. The catheter system of claim 1, further comprising a branch stent positioned on the side member.

16. The catheter system of claim 1, wherein the catheter body further includes a balloon inflation lumen, and further comprising a proximal end hub having a main vessel guidewire channel that is coupled to the main vessel guidewire lumen, a branch vessel guidewire channel that is coupled to the branch vessel guidewire lumen, and a balloon inflation port that is coupled to the balloon inflation lumen.

17. The stent delivery system of claim 16, wherein the first and second guidewire channels are separated by about zero to about 20°.

1 18. The stent delivery system of claim 10, wherein the distal end of the  
2 side member is unattached to the distal end of the main catheter.

1 19. The stent delivery system of claim 18, wherein the length over  
2 which the distal end of the side member is unattached to the distal end of the main  
3 catheter is approximately 2 to approximately 10 cm.

1 20. A kit comprising:  
2 a catheter system as set forth in claim 1; and  
3 instructions for use setting forth a method for positioning the side hole in  
4 the stent in registry with the ostium of a branch vessel.

1 21. A method for positioning a main vessel stent at a vessel bifurcation  
2 such that a side hole in the main vessel stent is in registry with an ostium of a branch  
3 vessel, the method comprising:

4 providing a catheter comprising a catheter body having a distal end, a  
5 proximal end, a main vessel guidewire lumen and a balloon disposed near the distal end  
6 of the catheter body, with the main vessel stent being disposed over the balloon, and a  
7 side member disposed adjacent the catheter body, the side member having a distal end, a  
8 proximal end, and a branch vessel guidewire lumen, wherein a distal portion of the side  
9 member is disposed beneath at least a portion of the main stent;

10 advancing a main vessel guidewire through a main vessel such that a distal  
11 end of the main vessel guidewire extends past the vessel bifurcation;

12 advancing the catheter over the main vessel guidewire, with the guidewire  
13 passing through the main vessel guidewire lumen;

14 advancing a branch vessel guidewire through the branch vessel guidewire  
15 lumen and into the branch vessel;

16 aligning the side hole of the main vessel stent with the ostium of the  
17 branch vessel by advancing the side member over the branch vessel guidewire and into  
18 the branch vessel; and

19 inflating the balloon to deploy the main vessel stent after the side hole has  
20 been aligned with the ostium.

1                   22.     A method as in claim 21, further comprising withdrawing the side  
2 member from the branch vessel, advancing a branch stent deployment device over the  
3 branch vessel guidewire, and deploying a branch vessel stent within the branch vessel  
4 using the side member.

1                   23.     A method as in claim 22, further comprising retracting the side  
2 member from the branch vessel while the catheter body remains within the main vessel.

1                   24.     A method as in claim 22, further comprising withdrawing the  
2 catheter from the main vessel and the branch vessel prior to advancing the branch stent  
3 deployment device.

1                   25.     A method as in claim 22, wherein the branch stent deployment  
2 device comprises an elongate body having a balloon at a distal end, wherein the branch  
3 stent is positioned over the balloon, and further comprising inflating the balloon to deploy  
4 the branch stent.

1                   26.     A method as in claim 21, wherein the side member includes a  
2 balloon at the distal end, and further comprising inflating the balloon to deploy a branch  
3 stent that is disposed over the balloon on the side member.

1                   27.     A method as in claim 26, further comprising moving the side  
2 member relative to the catheter body to position the branch stent prior to deployment.

1                   28.     A method as in claim 26, wherein the side member is fixedly  
2 attached to the catheter body, and further comprising moving catheter to position the  
3 branch stent prior to deployment.

1                   29.     A method as in claim 21, further comprising viewing relative  
2 movement of a marker on the catheter body relative to a marker on the side member,  
3 wherein relative movement indicates that the distal end of the side member that extends  
4 out of the side hole of the main vessel stent is advancing into the ostium of the branch  
5 vessel and that the side hole is aligning with the ostium of the branch vessel.

1 30. A method for positioning a main vessel stent at a vessel bifurcation  
2 such that a side hole in the main vessel stent is in registry with an ostium of a branch  
3 vessel, the method comprising:

4 providing a catheter comprising a catheter body having a distal end, a  
5 proximal end, a main vessel guidewire lumen and a balloon disposed near the distal end  
6 of the catheter body, with the main vessel stent being disposed over the balloon, and a  
7 side member disposed adjacent the catheter body, the side member having a distal end, a  
8 proximal end, and a branch vessel guidewire lumen, wherein a distal portion of the side  
9 member is disposed beneath at least a portion of the main stent while being unattached to  
10 the balloon, with the distal end of the side member extending out of the side hole;

11 introducing a main vessel guidewire into the main vessel lumen and a  
12 branch vessel guidewire into the branch vessel lumen;

13 advancing the catheter through a main vessel to be near the vessel  
14 bifurcation;

15 advancing the distal end of the side member over the branch guidewire and  
16 into the branch vessel;

17 aligning the side hole of the main vessel stent with the ostium of the  
18 branch vessel by further advancing the side member over the branch vessel guidewire and  
19 into the branch vessel; and

20 inflating the balloon to deploy the main vessel stent after the side hole has  
21 been aligned with the ostium.

1 31. A method as in claim 30, further comprising introducing the main  
2 vessel guidewire into the main vessel and the branch vessel guidewire into the branch  
3 vessel prior to the introduction of the main vessel guidewire and the branch vessel  
4 guidewire into the catheter, and advancing the catheter over the main vessel guidewire  
5 and the branch vessel guidewire.

1 32. A method as in claim 30, further comprising advancing the catheter  
2 through the main vessel while also advancing the main vessel guidewire and the branch  
3 vessel guidewire through the main vessel.

1 33. A method as in claim 32, further comprising advancing the catheter  
2 through a guide catheter and stopping advancement of the catheter once in the vicinity of

3 a distal edge of the guide catheter, and advancing the main vessel guidewire further  
4 through the main vessel and the branch vessel guidewire into the branch vessel.

1 34. A method as in claim 30, further comprising withdrawing the side  
2 member from the branch vessel, advancing a branch stent deployment device over the  
3 branch vessel guidewire, and deploying a branch vessel stent within the branch vessel  
4 using the side member.

1 35. A method as in claim 34, further comprising retracting the side  
2 member from the branch vessel while the catheter body remains within the main vessel.

1 36. A method as in claim 34, further comprising withdrawing the  
2 catheter from the main vessel and the branch vessel prior to advancing the branch stent  
3 deployment device.

1 37. A method as in claim 34, wherein the branch stent deployment  
2 device comprises an elongate body having a balloon at a distal end, wherein the branch  
3 stent is positioned over the balloon, and further comprising inflating the balloon to deploy  
4 the branch stent.

1 38. A method as in claim 30, wherein the side member includes a  
2 balloon at the distal end, and further comprising inflating the balloon to deploy a branch  
3 stent that is disposed over the balloon on the side member.

1 39. A method as in claim 38, further comprising moving the side  
2 member relative to the catheter body to position the branch stent prior to deployment.

1 40. A method as in claim 38, wherein the side member is fixedly  
2 attached to the catheter body, and further comprising moving catheter to position the  
3 branch stent prior to deployment.

1 41. A method as in claim 30, further comprising viewing relative  
2 movement of a marker on the catheter body relative to a marker on the side member,  
3 wherein relative movement indicates that the distal end of the side member that extends  
4 out of the side hole of the main vessel stent is advancing into the ostium of the branch  
5 vessel and that the side hole is aligning with the ostium of the branch vessel.

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